Trend Study 2-39-01

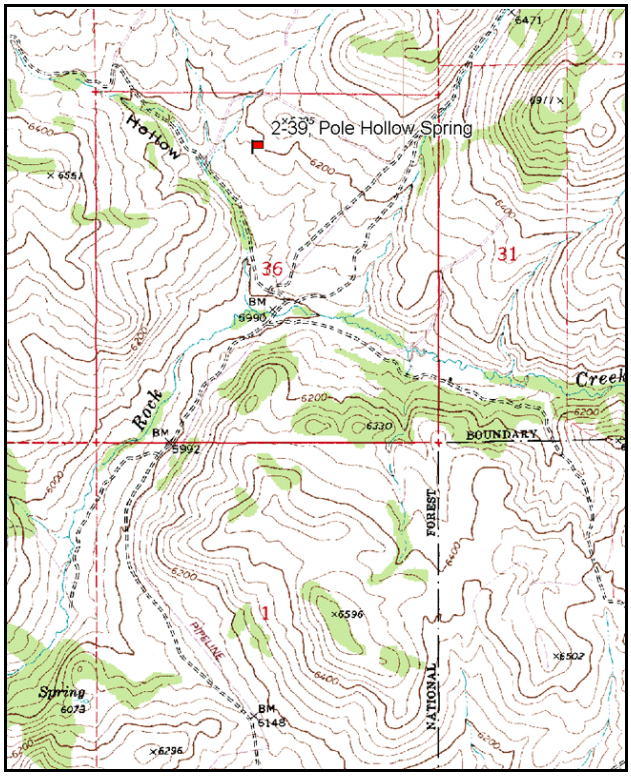
Study site name: Pole Hollow Spring . Vegetation type: Mountain Brush .

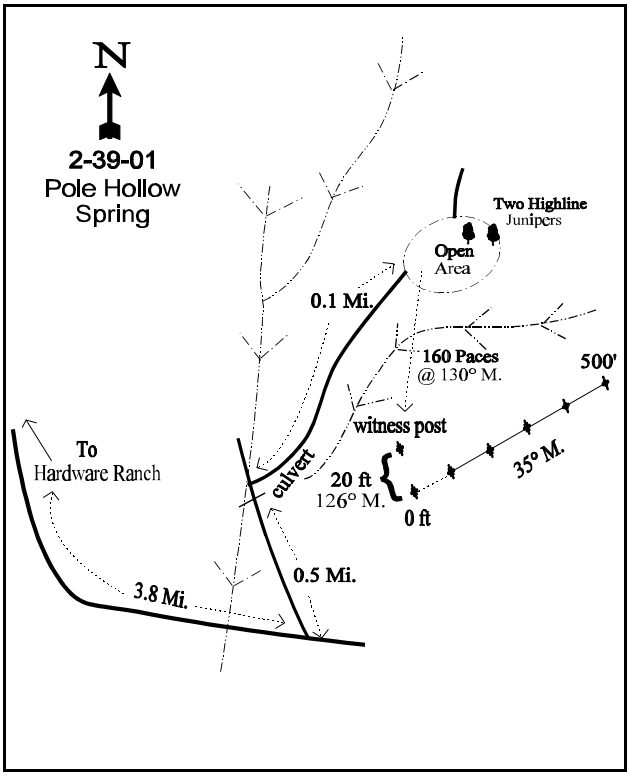
Compass bearing: frequency baseline 35 degrees magnetic.

Frequency belt placement: line 1 (11ft), line 2 (34ft), line 3 (59ft), line 4 (71ft), line 5 (95ft).

LOCATION DESCRIPTION

From Hardware Ranch, travel northeast for 3.8 miles to the Pole Hollow Road. Take a left and travel up Pole Hollow for 0.5 miles to a culvert. Take a right and drive 0.1 mile to an open area and park. From the open area, walk 160 paces at a bearing of 130 degrees magnetic to the witness post. From the witness post, walk 20 feet at a bearing of 126 degrees magnetic to the 0-foot baseline stake. The baseline runs at a bearing of 35 degrees magnetic.




Map Name: Boulder Mountain

Diagrammatic Sketch

Township 11N , Range 3E , Section 36

UTM 4611017 N, 454192 E

## DISCUSSION

### Trend Study No. 2-39

The Pole Hollow Spring study was established in 1996 and is 4 miles northeast of Hardware Ranch. The study monitors a mountain brush community on a southwest aspect with a slope of 15%. Elevation at the site is 6,200 feet. This area is best classified as summer/transitional range for wildlife. Elk and deer use of the area was minimal in 1996 and 2001. Cattle use the area in summer. Sheep may have also grazed here in past years. A pellet group transect read on site in 2001 estimated 13 deer days use/acre (32 ddu/ha) and 2 cow days use/acre (4 cdu/ha). No elk pellets were sampled in 2001.

Soil at the site is moderately deep with an estimated effective rooting depth (see methods) of nearly 20 inches. It has a clay texture and organic matter is high at 5.1%. Some gravel occurs in the profile and on the soil surface. Average cover of bare soil was 15% in 1996 and 2001. Vegetation and litter cover are abundant and well dispersed resulting in only limited erosion. Terracing and bare trails were noted in 2001, along with soil movement in small areas. An erosion condition class determined soils to be slightly eroding in 2001.

The site consists of a mixed mountain brush stand with several important browse species. The key species are mountain big sagebrush and bitterbrush. Serviceberry is present but not abundant with an estimated 180 plants/acre in 2001. Snowberry is abundant providing 27% of the browse cover on the site. The snowberry population is mostly mature and showed no use in 2001. Mountain big sagebrush has an estimated density of about 4,000 plants/acre. Utilization was light to moderate in 1996 and 2001, with vigor being generally good. Percent decadence was low even with a slight increase from 7% in 1996 to 16% in 2001. Mature sagebrush were robust and produced abundant seed in 2001, although annual leader growth was relatively low averaging less than 2 inches. Recruitment from young sagebrush plants is moderate and adequate to maintain the present population. The bitterbrush population was estimated at 660 plants/acre in 2001, which accounts for 23% of the shrub cover. Utilization was light to moderate and vigor good. There were no decadent plants sampled in 1996, but 21% of the population was classified as decadent in 2001. Recruitment was low, but with no dead plants in the population, the number of young are adequate to maintain the population. Bitterbrush annual leader growth averaged 3 ½ inches in 2001.

The dominant understory component is perennial grasses. However, the most numerous species is Kentucky bluegrass, an increaser. Bluebunch wheatgrass is also fairly abundant. However, both species significantly decreased in nested frequency in 2001, but still account for about 75% of the grass cover. Cheatgrass and Japanese brome are also present, although they were greatly reduced in abundance in 2001 due to drought. Smooth brome, Prairie junegrass, mutton bluegrass, Sandberg bluegrass, squirreltail, and Letterman needlegrass are all present but in limited numbers. Forbs are fairly abundant and diverse, but weedy and increaser species are present. Western yarrow, pacific aster, and thistle accounted for 68% of the forb cover in 1996. Other perennial forbs include silvery lupine, yellow salsify, and toadflax. When the site was established in 1996, field notes stated that areas dominated by bluebunch wheatgrass were less heavily grazed. Those places dominated by Kentucky bluegrass were more heavily used and contained a higher number of weedy forbs. It was also noted that nearby meadow areas contained large amounts of tarweed, mulesears, and curlycup gumweed.

#### 1996 APPARENT TREND ASSESSMENT

Percent vegetation and litter cover are high and well dispersed. Erosion is not currently a problem and the soil trend appears stable. The browse trend also appears stable with mostly light utilization on all browse. Good reproduction was also found for the key species. The herbaceous understory is abundant and diverse but composition is poor, especially for forbs. Kentucky bluegrass is the most abundant grass, indicating past

heavy grazing. Aggressive weedy forbs dominate the forb composition. Future trends will be determined by compositional changes in grasses and forbs.

2001 TREND ASSESSMENT

Trend for soil is stable. Protective vegetation and litter cover are abundant and well disbursed except along some trails that have bare soil exposed. Trend for browse is stable. The key species, mountain big sagebrush and bitterbrush, show light to moderate use and normal vigor. Percent decadency increased for both species but remains within normal limits for these species, especially during consecutive dry years. Trend for the herbaceous understory is stable. Sum of nested frequency for perennial grasses and forbs remains stable. Species classified as weedy and/or increasers are still abundant.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Herd unit 02 , Study no: 39

| Type | Species | Nested Frequency | | Quadrat Frequency | | Average Cover % | |
|---|---|---|---|---|---|---|---|
| | | '96 | '01 | '96 | '01 | '96 | '01 |
| G | Agropyron spicatum | 214 | *109 | 64 | 33 | 6.75 | 2.46 |
| G | Bromus inermis | 3 | *16 | 1 | 4 | .03 | .48 |
| G | Bromus japonicus (a) | 144 | *66 | 43 | 25 | 2.54 | .29 |
| G | Bromus tectorum (a) | 32 | *1 | 11 | 1 | 1.62 | .03 |
| G | Elymus cinereus | - | 1 | - | 1 | - | .00 |
| G | Koeleria cristata | 29 | 32 | 13 | 9 | .26 | .49 |
| G | Poa fendleriana | 13 | *41 | 4 | 14 | .12 | 1.08 |
| G | Poa pratensis | 279 | *251 | 78 | 62 | 8.06 | 11.56 |
| G | Poa secunda | 8 | 21 | 4 | 6 | .19 | .51 |
| G | Sitanion hystrix | 14 | 14 | 5 | 9 | .10 | .48 |
| G | Stipa lettermani | 42 | 50 | 19 | 17 | .40 | 1.45 |
| Total for Annual Grasses | | 176 | 67 | 54 | 26 | 4.17 | 0.32 |
| Total for Perennial Grasses | | 602 | 535 | 188 | 155 | 15.94 | 18.54 |
| Total for Grasses | | 778 | 602 | 242 | 181 | 20.11 | 18.87 |
| F | Achillea millefolium | 98 | 77 | 39 | 30 | 1.71 | .91 |
| F | Agoseris glauca | 5 | - | 2 | - | .01 | - |
| F | Allium spp. | - | *47 | - | 21 | - | .33 |
| F | Artemisia ludoviciana | 6 | 7 | 2 | 2 | .30 | .30 |
| F | Aster chilensis | 166 | 170 | 52 | 49 | 2.75 | 3.96 |
| F | Astragalus convallarius | 9 | 16 | 4 | 8 | .04 | .16 |
| F | Balsamorhiza macrophylla | 5 | - | 1 | - | .03 | .03 |

| Type | Species | Nested Frequency | | Quadrat Frequency | | Average Cover % | |
|---|---|---|---|---|---|---|---|
| | | '96 | '01 | '96 | '01 | '96 | '01 |
| F | Calochortus nuttallii | - | 3 | - | 1 | - | .03 |
| F | Cirsium undulatum | 19 | 14 | 10 | 8 | .49 | .21 |
| F | Collomia linearis (a) | - | *48 | - | 22 | - | .18 |
| F | Comandra pallida | 4 | *54 | 4 | 19 | .07 | .90 |
| F | Collinsia parviflora (a) | 3 | *27 | 3 | 11 | .01 | .10 |
| F | Cryptantha spp. | 1 | - | 1 | - | .00 | - |
| F | Eriogonum umbellatum | 7 | - | 2 | - | .06 | - |
| F | Geranium richardsonii | - | 2 | - | 2 | .03 | .03 |
| F | Hackelia patens | - | 2 | - | 1 | - | .00 |
| F | Helianthella uniflora | 2 | - | 2 | - | .06 | - |
| F | Ipomopsis aggregata | 2 | - | 1 | - | .03 | - |
| F | Lappula occidentalis (a) | 3 | - | 1 | - | .00 | - |
| F | Lupinus argenteus | 50 | 63 | 25 | 33 | 1.12 | 1.74 |
| F | Microsteris gracilis (a) | 10 | *23 | 3 | 10 | .01 | .05 |
| F | Orthocarpus luteus (a) | 1 | *21 | 1 | 9 | .03 | .72 |
| F | Penstemon humilis | 4 | 4 | 2 | 1 | .01 | .00 |
| F | Phlox longifolia | 5 | - | 2 | - | .01 | - |
| F | Potentilla diversifolia | 1 | - | 1 | - | .15 | - |
| F | Polygonum douglasii (a) | 14 | 20 | 5 | 6 | .02 | .03 |
| F | Senecio multilobatus | 3 | 4 | 1 | 2 | .00 | .06 |
| F | Taraxacum officinale | 3 | 7 | 1 | 2 | .00 | .01 |
| F | Tragopogon dubius | 19 | 28 | 11 | 13 | .20 | .41 |
| F | Veronica biloba (a) | 12 | 13 | 3 | 4 | .01 | .04 |
| F | Viguiera multiflora | 3 | - | 3 | - | .04 | - |
| F | Wyethia amplexicaulis | 3 | 3 | 1 | 1 | .00 | .00 |
| F | Zigadenus paniculatus | 2 | 2 | 1 | 1 | .00 | .00 |
| Total for Annual Forbs | | 43 | 152 | 16 | 62 | 0.10 | 1.13 |
| Total for Perennial Forbs | | 417 | 503 | 168 | 194 | 7.17 | 9.13 |
| Total for Forbs | | 460 | 655 | 184 | 256 | 7.27 | 10.27 |

* Indicates significant difference at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 02 , Study no: 39

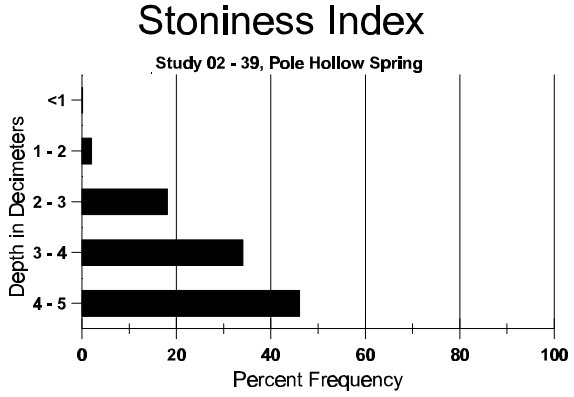
| Type | Species | Strip Frequency '96 | Strip Frequency '01 | Average Cover % '96 | Average Cover % '01 |
|---|---|---|---|---|---|
| B | Amelanchier alnifolia | 12 | 7 | .18 | .97 |
| B | Artemisia tridentata vaseyana | 83 | 87 | 12.31 | 16.63 |
| B | Chrysothamnus viscidiflorus viscidiflorus | 72 | 54 | 2.93 | 2.71 |
| B | Eriogonum heracleoides | 2 | 1 | - | - |
| B | Mahonia repens | 28 | 37 | 1.49 | 1.11 |
| B | Purshia tridentata | 23 | 30 | 7.86 | 9.56 |
| B | Symphoricarpos oreophilus | 53 | 58 | 11.23 | 11.42 |
| Total for Browse | | 273 | 274 | 36.02 | 42.42 |

BASIC COVER --
Herd unit 02 , Study no: 39

| Cover Type | Nested Frequency '96 | Nested Frequency '01 | Average Cover % '96 | Average Cover % '01 |
|---|---|---|---|---|
| Vegetation | 464 | 462 | 55.67 | 61.97 |
| Rock | 46 | 11 | .50 | .19 |
| Pavement | 117 | 137 | 1.85 | 1.89 |
| Litter | 495 | 489 | 56.73 | 41.05 |
| Bare Ground | 229 | 223 | 14.36 | 15.38 |

SOIL ANALYSIS DATA --
Herd Unit 02, Study no: 39, Pole Hollow Spring

| Effective rooting depth (in) | Temp °F (depth) | PH | %sand | %silt | %clay | %0M | PPM P | PPM K | dS/m |
|---|---|---|---|---|---|---|---|---|---|
| 19.5 | 52.8 (18.1) | 7.0 | 28.6 | 27.4 | 44.0 | 5.1 | 28.8 | 249.6 | 1.3 |



PELLET GROUP FREQUENCY --
Herd unit 02 , Study no: 39

| Type | Quadrat Frequency | | Pellet Transect | |
|---|---|---|---|---|
| | | | Pellet Groups per Acre | Days Use per Acre (ha) |
| | '96 | '01 | ⁄01 | ⁄01 |
| Elk | 6 | - | - | - |
| Deer | 2 | - | 165 | 13 (32) |
| Cattle | 2 | - | 17 | 2 (4) |

BROWSE CHARACTERISTICS --
Herd unit 02 , Study no: 39

| AGE | YR | Form Class (No. of Plants) 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Vigor Class 1 | 2 | 3 | 4 | Plants Per Acre | Average (inches) Ht. | Cr. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Amelanchier alnifolia | | | | | | | | | | | | | | | | | | |
| S | 96 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | | 0 |
| | 01 | 1 | - | - | - | - | - | - | - | - | 1 | - | - | - | 20 | | | 1 |
| Y | 96 | 2 | - | - | - | - | - | - | - | - | 1 | 1 | - | - | 40 | | | 2 |
| | 01 | 3 | - | - | - | - | - | - | - | - | 3 | - | - | - | 60 | | | 3 |
| M | 96 | 4 | 6 | 1 | 12 | - | - | - | - | - | 16 | 6 | 1 | - | 460 | 33 | 33 | 23 |
| | 01 | 4 | 2 | - | - | - | - | - | - | - | 6 | - | - | - | 120 | 44 | 44 | 6 |

| % Plants Showing | Moderate Use | Heavy Use | Poor Vigor | %Change |
|---|---|---|---|---|
| '96 | 24% | 04% | 04% | -64% |
| '01 | 22% | 00% | 00% | |

| Total Plants/Acre (excluding Dead & Seedlings) | | | | |
|---|---|---|---|---|
| '96 | 500 | Dec: | | - |
| '01 | 180 | | | - |

| AGE | YR | Form Class (No. of Plants) 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Vigor Class 1 | 2 | 3 | 4 | Plants Per Acre | Average (inches) Ht. | Cr. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Artemisia tridentata vaseyana | | | | | | | | | | | | | | | | | | |
| S | 96 | 21 | - | - | - | - | - | - | - | - | 21 | - | - | - | 420 | | | 21 |
| | 01 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | | 0 |
| Y | 96 | 16 | 1 | - | 2 | - | - | - | - | - | 19 | - | - | - | 380 | | | 19 |
| | 01 | 24 | - | - | - | - | - | - | - | - | 24 | - | - | - | 480 | | | 24 |
| M | 96 | 114 | 45 | 7 | 1 | - | - | - | - | - | 167 | - | - | - | 3340 | 25 | 34 | 167 |
| | 01 | 119 | 23 | 2 | - | 2 | - | - | - | - | 139 | 3 | 4 | - | 2920 | 29 | 35 | 146 |
| D | 96 | 4 | 9 | 2 | - | - | - | - | - | - | 13 | - | - | 2 | 300 | | | 15 |
| | 01 | 14 | 15 | 3 | - | - | - | - | - | - | 27 | - | 4 | 1 | 640 | | | 32 |
| X | 96 | - | - | - | - | - | - | - | - | - | - | - | - | - | 700 | | | 35 |
| | 01 | - | - | - | - | - | - | - | - | - | - | - | - | - | 140 | | | 7 |

| % Plants Showing | Moderate Use | Heavy Use | Poor Vigor | %Change |
|---|---|---|---|---|
| '96 | 27% | 04% | .99% | + 0% |
| '01 | 20% | 02% | 04% | |

| Total Plants/Acre (excluding Dead & Seedlings) | | | | |
|---|---|---|---|---|
| '96 | 4020 | Dec: | | 7% |
| '01 | 4040 | | | 16% |

| AGE | YR | Form Class (No. of Plants) 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Vigor Class 1 | 2 | 3 | 4 | Plants Per Acre | Average (inches) Ht. | Cr. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chrysothamnus viscidiflorus viscidiflorus | | | | | | | | | | | | | | | | | | |
| Y | 96 | 6 | - | - | - | - | - | - | - | - | 6 | - | - | - | 120 | | | 6 |
| | 01 | 1 | - | - | - | - | - | - | - | - | 1 | - | - | - | 20 | | | 1 |
| M | 96 | 126 | - | - | 16 | - | - | - | - | - | 142 | - | - | - | 2840 | 18 | 21 | 142 |
| | 01 | 111 | - | - | 2 | - | - | - | - | - | 109 | 4 | - | - | 2260 | 14 | 16 | 113 |
| D | 96 | 9 | 1 | - | 2 | - | - | - | - | - | 5 | - | 3 | 4 | 240 | | | 12 |
| | 01 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | | 0 |

| % Plants Showing | Moderate Use | Heavy Use | Poor Vigor | %Change |
|---|---|---|---|---|
| '96 | .62% | 00% | 04% | -29% |
| '01 | 00% | 00% | 00% | |

| Total Plants/Acre (excluding Dead & Seedlings) | | | | |
|---|---|---|---|---|
| '96 | 3200 | Dec: | | 8% |
| '01 | 2280 | | | 0% |

| Eriogonum heracleoides | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M | 96 | 3 | - | - | - | - | - | - | - | - | 3 | - | - | - | 60 | 7 | 19 | 3 |
| | 01 | - | 1 | - | - | - | - | - | - | - | 1 | - | - | - | 20 | 6 | 9 | 1 |

| % Plants Showing | Moderate Use | Heavy Use | Poor Vigor | %Change |
|---|---|---|---|---|
| '96 | 00% | 00% | 00% | -67% |
| '01 | 100% | 00% | 00% | |

| Total Plants/Acre (excluding Dead & Seedlings) | | | |
|---|---|---|---|
| '96 | 60 | Dec: | - |
| '01 | 20 | | - |

| Mahonia repens | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | 96 | - | - | - | 2 | - | - | - | - | - | 2 | - | - | - | 40 | | | 2 |
| | 01 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | | 0 |
| Y | 96 | 55 | - | - | 3 | - | - | - | - | - | 58 | - | - | - | 1160 | | | 58 |
| | 01 | 1 | - | - | - | - | - | - | - | - | 1 | - | - | - | 20 | | | 1 |
| M | 96 | 220 | - | - | 4 | - | - | - | - | - | 224 | - | - | - | 4480 | 4 | 5 | 224 |
| | 01 | 303 | - | - | - | - | - | - | - | - | 287 | 16 | - | - | 6060 | 3 | 4 | 303 |

| % Plants Showing | Moderate Use | Heavy Use | Poor Vigor | %Change |
|---|---|---|---|---|
| '96 | 00% | 00% | 00% | + 7% |
| '01 | 00% | 00% | 00% | |

| Total Plants/Acre (excluding Dead & Seedlings) | | | |
|---|---|---|---|
| '96 | 5640 | Dec: | - |
| '01 | 6080 | | - |

| AGE | YR | Form Class (No. of Plants) 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Vigor Class 1 | 2 | 3 | 4 | Plants Per Acre | Average (inches) Ht. | Cr. | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Purshia tridentata | | | | | | | | | | | | | | | | | | |
| Y | 96 | 2 | 1 | - | - | - | - | - | - | - | 3 | - | - | - | 60 | | | 3 |
| | 01 | 1 | 1 | - | - | - | - | - | - | - | 2 | - | - | - | 40 | | | 2 |
| M | 96 | 11 | 9 | - | 2 | - | - | - | - | - | 22 | - | - | - | 440 | 35 | 62 | 22 |
| | 01 | 18 | 3 | 2 | 1 | - | - | - | - | - | 24 | - | - | - | 480 | 34 | 47 | 24 |
| D | 96 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | | 0 |
| | 01 | - | 6 | 1 | - | - | - | - | - | - | 6 | - | - | 1 | 140 | | | 7 |
| X | 96 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | | 0 |
| | 01 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | | 0 |

| % Plants Showing | Moderate Use | Heavy Use | Poor Vigor | %Change |
|---|---|---|---|---|
| '96 | 40% | 00% | 00% | +24% |
| '01 | 30% | 09% | 03% | |

| Total Plants/Acre (excluding Dead & Seedlings) | | | | |
|---|---|---|---|---|
| '96 | 500 | Dec: | | 0% |
| '01 | 660 | | | 21% |

| Quercus gambelii | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M | 96 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | - | - | 0 |
| | 01 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | 36 | 43 | 0 |

| % Plants Showing | Moderate Use | Heavy Use | Poor Vigor | %Change |
|---|---|---|---|---|
| '96 | 00% | 00% | 00% | |
| '01 | 00% | 00% | 00% | |

| Total Plants/Acre (excluding Dead & Seedlings) | | | |
|---|---|---|---|
| '96 | 0 | Dec: | - |
| '01 | 0 | | - |

| Symphoricarpos oreophilus | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | 96 | 5 | - | - | - | - | - | - | - | - | 5 | - | - | - | 100 | | | 5 |
| | 01 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | | 0 |
| Y | 96 | 8 | - | - | 5 | - | - | - | - | - | 13 | - | - | - | 260 | | | 13 |
| | 01 | 3 | - | - | - | - | - | - | - | - | 3 | - | - | - | 60 | | | 3 |
| M | 96 | 79 | - | - | 12 | - | - | - | - | - | 91 | - | - | - | 1820 | 32 | 51 | 91 |
| | 01 | 81 | - | - | - | - | - | - | - | - | 80 | - | 1 | - | 1620 | 32 | 51 | 81 |
| D | 96 | 2 | 1 | - | - | - | - | - | - | - | 1 | - | - | 2 | 60 | | | 3 |
| | 01 | 7 | - | - | - | - | - | - | - | - | 6 | - | - | 1 | 140 | | | 7 |
| X | 96 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | | 0 |
| | 01 | - | - | - | - | - | - | - | - | - | - | - | - | - | 40 | | | 2 |

| % Plants Showing | Moderate Use | Heavy Use | Poor Vigor | %Change |
|---|---|---|---|---|
| '96 | .93% | 00% | 02% | -15% |
| '01 | 00% | 00% | 02% | |

| Total Plants/Acre (excluding Dead & Seedlings) | | | |
|---|---|---|---|
| '96 | 2140 | Dec: | 3% |
| '01 | 1820 | | 8% |